

ENERGETICS

DENERG - Proton Ceramic Cells (PCC) stacks for ultra-pure hydrogen production

Funded By	Dipartimento DENERG
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Context of the research activity	Hydrogen technologies Proton Conducting Ceramic Electrolysis (PCCEL) Testing and modeling

Objectives	<p>The PhD activity will be carried out mainly at the HySyLab/CO₂ Circle Lab of Politecnico di Torino, in the context of the SNAM H₂ Innovation Center of Torino (Politecnico di Torino, IIT ed Environment Park: raggruppamento temporaneo di imprese, Politecnico di Torino mandatario, IIT ed Environment Park mandanti).</p> <p>In particular, the scientific activity will be developed in close collaboration with SNAM (funding the activity) and POLIMI + University of California Irvine + University of Madison (Partners of POLITO in the activity).</p> <p>Scope: the aim is to contribute to solving main issues that currently affect PCCs.</p> <p>Approach & Methodology: Identification, development and testing of materials for the electrodes (new materials for the anode and improvements in the microstructure at the cathode). Identification, development and testing of materials suitable as electrolyte. Focus on sealing materials and interconnectors. Tests on performance and degradation at SRU / short-stack level</p> <ul style="list-style-type: none"> • Improvement and identification of material for the electrodes: identification, development and testing of electrode materials for the anode. Improvement of the microstructure of the cathodic electrode • Improvement and identification of material for the electrolyte: identification, development and testing of materials suitable as electrolyte (good chemical stability and good electronic and proton conductivity) • Buttons cells and cells testing: after identifying electrode and electrolyte materials, tests at buttons cells and cells level will be performed to investigate performance and degradation • Interconnectors and sealing • Short-stack assembly and testing: after identifying interconnectors and
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sealing materials, assembly of short-stacks and tests to investigate performance and degradation

Skills and competencies for the development of the activity

- Ceramic materials
- Electro-catalysis
- Kinetic
- Thermodynamics
- Heat transfer
- Experimental capabilities on electrochemical technologies and processes
- Modeling capabilities in terms of multi-physics phenomena (electrochemical, thermal, mass transport)